

**TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371**

INTERNATIONAL APPLICATION NO.
PCT/EP00/00910

INTERNATIONAL FILING DATE
February 4, 2000

TITLE OF INVENTION

COLORING CERAMICS BY WAY OF IONIC OR COMPLEX-CONTAINING SOLUTIONS

APPLICANT(S) FOR DO/EO/US

SUTTOR, Daniel; HAUPTMANN, Holger; SCHNAGL, Robert; FRANK, Sybille

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (1).
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau). WO 00/46168
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☒ is transmitted herewith.
 - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4)
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☒ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 20. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98-International Search Report (PCT/ISA/210) w/ 9 documents
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information:
 - 1.) Certified copy of the translation of the International Application
 - 2.) Zero (0) sheets of Formal Drawings

02/2448 0690

PCT/EP00/00910

0475-0192P

21. ☒ The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5):**

Neither international preliminary examination fee (37 CFR 1.482)
nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO
and International Search Report not prepared by the EPO or JPO. **\$1,000.00**

International preliminary examination fee (37 CFR 1.482) not paid to
USPTO but International Search Report prepared by the EPO or JPO. **\$860.00**

International preliminary examination fee (37 CFR 1.482) not paid to USPTO
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International preliminary examination fee (37 CFR 1.482) paid to USPTO
but all claims did not satisfy provisions of PCT Article 33(1)-(4). **\$690.00**

International preliminary examination fee (37 CFR 1.482) paid to USPTO
and all claims satisfied provisions of PCT Article 33(1)-(4). **\$100.00**

ENTER APPROPRIATE BASIC FEE AMOUNT =

Surcharge of \$130.00 for furnishing the oath or declaration later than ☒ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(e)).

| CLAIMS | NUMBER FILED | NUMBER EXTRA | RATE |
|--------------------|--------------|--------------|-----------|
| Total Claims | 17 - 20 = | 0 | X \$18.00 |
| Independent Claims | 2 - 3 = | 0 | X \$80.00 |

MULTIPLE DEPENDENT CLAIM(S) (if applicable) Yes ☐ No ☒ + \$270.00

TOTAL OF ABOVE CALCULATIONS =

☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are
reduced by 1/2.

SUBTOTAL =

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(f)).

TOTAL NATIONAL FEE =

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +

TOTAL FEES ENCLOSED =

Amount to be:
refunded \$
charged \$

- a. ☒ A check in the amount of \$ **1260.00** to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any
overpayment to Deposit Account No. 02-2448.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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Date: August 3, 2001

By

Andrew D. Meikle, #32,868

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF TRANSLATION

Honourable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

I, CARLY EMMA MARY ROSE, BSc, Technical Translator, of c/o Priory
Translations Limited, 11, Magdalen Street, Colchester, Essex, England,
hereby state:

THAT I am well acquainted with the German and English languages.

THAT I translated the document identified as PCT Patent Application No.
PCT/EP00/00910 filed on 4th February 2000, plus amended claim, from German
into English;

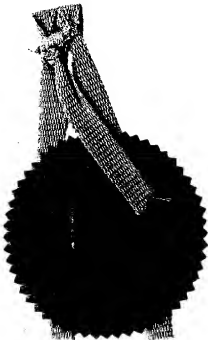
THAT the attached English translation is a true and correct translation of PCT
Patent Application No. PCT/EP00/00910, plus amended claim,
to the best of my knowledge and belief; and

THAT all statements made of my own knowledge are true and that all
statements made on information and belief are believed to be true and further,
that these statements are made with the knowledge that wilful false statements
and the like are punishable by fine or imprisonment, or both, under Section 1001
of Title 18 of the United States Code



CARLY EMMA MARY ROSE

09/890690 PCT/PTO



PATENT
0475-0192P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: SUTTOR, Daniel et al. Conf.:
Int'l. Appl. No.: PCT/EP00/00910
Appl. No.: New Group:
Filed: August 3, 2001 Examiner:
For: COLORING CERAMICS BY WAY OF IONIC OR COMPLEX-
CONTAINING SOLUTIONS

PRELIMINARY AMENDMENT

BOX PATENT APPLICATION

Assistant Commissioner for Patents
Washington, DC 20231

August 3, 2001

Sir:

The following Preliminary Amendments and Remarks are respectfully submitted in connection with the above-identified application.

AMENDMENTS

IN THE SPECIFICATION:

Please amend the specification as follows:

Before line 1, insert --This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/EP00/00910 which has an International filing date of February 4, 2000, which designated the United States of America and was not published in English.--

IN THE CLAIMS:

Please amend the claims as follows:

5. (Amended) Process according to claim 3, characterized in that chlorides, acetates or alcohols as well as oxo complexes are used as salts.

6. (Amended) Process according to claim 1, characterized in that dental ceramics are used in the pre-sintered state.

7. Process according to claim 1, characterized in that dental ceramics based on zirconium oxide or aluminum oxide are used.

8. (Amended) Process according to claim 1, characterized in that the ionic or complex-containing solutions are water- or alcohol-based.

9. (Amended) Process according to claim 1, characterized in that the action time of the ionic or complex-containing solutions is a matter of hours, in particular under two hours, quite particularly under 1 hour and particularly preferably under 20 minutes.

10. (Amended) Process according to claim 1, characterized in that the concentration of the solutions is 0.001 to 15 wt %.

11. (Amended) Process according to claim 1, characterized in that colouring takes place by immersion of the ceramic in the solutions, deposition of the solutions to the ceramic with the help of application instruments or by spraying of the solutions onto the ceramic.

12. (Amended) Process according to claim 1, characterized in that the ceramics to be coloured have a diameter of 10 mm, preferably 7 mm, and a height of 7 mm, preferably 5 mm.

13. (Amended) Process according to claim 1, characterized in that the ceramics are completely through-coloured.

REMARKS

The specification has been amended to provide a cross-reference to the previously filed International Application. The claims have also been amended to delete improper multiple dependencies and to place the application into better form for examination. Entry of the present amendment and favorable action on the above-identified application are earnestly solicited.

Attached hereto is a marked-up copy of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By 

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Attachment: Version With Markings Showing Changes Made

(Rev. 01/22/01)

VERSION WITH MARKINGS SHOWING CHANGES MADE

The specification has been amended to provide cross-referencing to the International Application.

The claims have been amended as follows:

5. (Amended) Process according to claim 3 [or 4], characterized in that chlorides, acetates or alcohols as well as oxo complexes are used as salts.

6. (Amended) Process according to [at least one of claims 1 to 5]claim 1, characterized in that dental ceramics are used in the pre-sintered state.

7. Process according to [at least one of claims 1 to 6]claim 1, characterized in that dental ceramics based on zirconium oxide or aluminum oxide are used.

8. (Amended) Process according to [at least one of claims 1 to 7]claim 1, characterized in that the ionic or complex-containing solutions are water- or alcohol-based.

9. (Amended) Process according to [at least one of claims 1 to 8]claim 1, characterized in that the action time of the ionic or complex-containing solutions is a matter of hours, in particular under two hours, quite particularly under 1 hour and particularly preferably under 20 minutes.

10. (Amended) Process according to [at least one of claims [at least one of claims 1 to 9]claim 1, characterized in that the concentration of the solutions is 0.001 to 15 wt -%.

11. (Amended) Process according to [at least one of claims 1 to 10]claim 1, characterized in that colouring takes place by immersion of the ceramic in the solutions, deposition of the solutions to the ceramic with the help of application instruments or by spraying of the solutions onto the ceramic.

12. (Amended) Process according to [at least one of claims 1 to 11]claim 1, characterized in that the ceramics to be coloured have a diameter of 10 mm, preferably 7 mm, and a height of 7 mm, preferably 5 mm.

13. (Amended) Process according to [at least one of claims 1 to 12]claim 1, characterized in that the ceramics are completely through-coloured.

Colouring of ceramics by means of ionic or complex-
containing solutions

5 The invention relates to the colouring of ceramics by means of ionic or complex-containing solutions. The invention relates in particular to the colouring of dental ceramics based on zirconium oxide by means of solutions of rare earth metals and subgroup elements.

10

Ceramics are much valued, because of their physical properties, in the construction of high-quality dentures. Aluminium and zirconium oxide ceramics have long been the materials of choice in the medical field (Reprint from

15 Industrie Diamanten Rundschau, IDR 2/1993, "Aluminium- und Zirkonoxidkeramik in der Medizin"). There are a number of publications in the dental field which deal with the use of ceramics for the preparation of prostheses. Various ceramic systems are also already available on the dental market
20 (CEREC, Fa. Siemens; Procera, Fa. Nobel-Biocare).

In the dental field in particular, however, it is not only the mechanical parameters that play a major role, but also specially the aesthetics. Translucence and coloration of
25 the framework or facing ceramics are important, in order to allow the patient to achieve a natural appearance for his dentures.

Dentures are normally prepared from a framework and a
30 facing.

In the case of the systems known up until now, only a superficial individual colouring of the basic framework can be carried out by the dental technician, the aesthetic design possibilities being limited.

5

In order to achieve a natural appearance of the prosthesis, the tooth colour and the translucence must be simulated over several layers, beginning with the framework.

10

The natural appearance of a prosthesis is guaranteed by as high as possible a free path length $z = x + y + m$ of the incident light through the layer (x) of the facing ceramic and the layer (m) of the framework ceramic and optionally an intermediate layer (y).

15

In order to change the basic shade of the framework ceramic, conventional systems must work with colouring intermediate layers, for example opaquer liners, which display no, or greatly reduced, translucence; the free path length of the light decreases by the thickness of the framework ceramic (m) and of the intermediate layer (y) to $z = x$. A description of this procedure can be found in e.g. the instructions issued by Vita for the use of the Vita-Dur system □ or by DUCERA for the ALL Ceram system.

25

Such systems use, as intermediate layer, dye pastes or dye suspensions, which are applied to the framework by the dental technician in several procedures and are finally fired in the oven.

30

This process is not only time-consuming, but also cost-intensive.

The object of the invention is thus to provide a system for the colouring of ceramics, in particular ceramic dentures, which guarantees an optimum aesthetic appeal with minimal
5 outlay on labour and with costs reduced to the minimum.

Surprisingly, this object is achieved by a process for the colouring of ceramics in the porous or absorbent state, which is characterized in that the ceramics are translucent
10 and metal ion solutions or metal complex solutions are used for the colouring. Solutions preferred for this contain defined concentrations of at least one of the salts or complexes of the rare earth elements or the elements of the subgroups.

15 The solutions are preferably water- or alcohol-based. Suitable salts or complexes are preferably those from the group of the rare earths or the 2nd or 8th subgroups, in particular Pr, Er, Fe, Co, Ni, Cu.

20 Salts or complexes with inorganic opposed ions such as e.g. Cl^- , Br^- , J^- , SO_4^{2-} , SO_3^{2-} , NO_2^- , NO_3^- , ClO_4^- , ONC^- , SCN^- , are preferred, which can also mean oxo complexes of acid or basic salts, but not double salts with an element of the
25 1st or 2nd main groups. Furthermore, salts or complexes with organic ions or ligands are preferred which contain 1 to 30 C atoms and from 1 to 10 heteroatoms, such as O, N, S. In detail, these are alkoxides or salts of organic acids. Preferred here among the alkoxides are the salts of
30 the C_1 - C_{10} -alkanols, in particular the methoxides, ethoxides, n- and i-propoxides and n-, i-, sec. or tert.-butoxides. Among the salts of organic acids, those of

mono-, di- and tri-C₁-C₂₀-carboxylic acids are preferred, in particular formate, acetate, malate, maleate, maleinate, tartate, oxalate. Finally, the ligands are also taken to include complexing agents serving to stabilise the metal salts in their oxidation stage and in solution. These can be organic C₂-C₂₀ molecules with up to 10 hetero atoms, O, N or S, including in particular EDTA and its salts, NTA, salicylic acid, phenols, 5-sulphosalicylic acid etc.

10 Aqueous or alcoholic solutions of Pr, Er, Fe, are preferred, for example as chlorides, acetates or alcoholates.

15 The ions or complexes are preferably used in concentrations of 0.0001 to 15 wt.-%, particularly preferably from 0.001 to 10 wt.-% and quite particularly preferably from 0.01 to 7 wt.-%.

20 By ceramics and dental ceramics are meant here all high-strength oxides of the elements of the main groups II, III and IV and the subgroups III and IV as well as their mixtures, in particular Al₂O₃, ZrO₂, both partly and also fully stabilised, MgO, TiO₂ and their mixtures. In particular, translucent ceramics are taken to be covered by
25 the term ceramics and dental ceramics.

Furthermore it is surprising that the depth of colour of the colouring is not dependent on the action time of the solution but only on its concentration. This is
30 particularly advantageous, as the dental technician is not tied to action times accurate to within a few seconds, but can perform his work within certain tolerances for as long

as is desired with the solutions according to the invention. The action time of the solution can in theory be as long as desired. It depends only on other effects in the solution, for example pH-value changes or the release of
5 ions, which can hinder the colouring process. The result is generally an action time, until the depth of colour of the colouring does not change, of a few hours. The action time is preferably under 2 hours, in particular under 1 hour and particularly preferably under 20 minutes.

10 Advantageously, the above mentioned intermediate layer (y) can be completely dispensed with thanks to the present invention, as the framework ceramic can already be individually coloured by the solutions according to the
15 invention. An additional cost- and time-intensive step of the firing of the intermediate layer is therefore dispensed with. Only the free path length $z = x+y+m$ is available to the incident light, as the path is no longer interrupted by the intermediate light.

20 The solutions according to the invention can also contain, alongside the salts or complexes of the rare earth elements or the subgroup elements, stabilising agents, such as complexing agents, grinding auxiliaries as well as organic
25 dye stuff pigments to facilitate the matching of the colour by the dental technician.

Complexing agents, such as ethylenediaminetetra acetic acid, are suitable as stabilising agents. Grinding
30 auxiliaries are taken to include for example temporary binders and thixotropy agents, such as polyglycols,

polysaccharides, polyethylene glycols, polyvinyl alcohols, hydrogenated castor oils.

Due to the low concentrations of colouring ions or complexes within the solutions according to the invention and the associated poor optical recognizability of the applied shade, organic pigments can also be added to facilitate the matching of colour by the dental technician. These additives are particularly helpful during the application of the solutions to specific areas by means of application instruments. The additives are to be chosen so that they are destroyed without leaving any residue upon the firing of the prosthetic work.

The solutions according to the invention can be applied in the following ways to the pre-sintered or absorbent ceramics:

1. Immersion of the ceramic in solutions of defined concentrations;
2. Deposition of the solutions to the ceramic by means of suitable application instruments, for example, brush, swab;
3. Deposition of the solutions to the ceramic by means of spraying processes.

Wall thicknesses of up to 10 mm, preferably 7 mm, are thoroughly coloured by means of the process according to the invention. In particular in the dental field, dimensions of 10 mm, preferably 7 mm, for the diameter of a workpiece and 7 mm, preferably 5 mm, for the height of a workpiece are possible in the preparation of crowns and

bridges. These mm values relate to the thicknesses of the colourable wall thickness of the dental workpieces. Naturally, workpieces outside the limits given here are also contained in the scope of the invention.

The ceramics are preferably completely through-coloured.

The invention also relates to a kit, comprising

- (i) at least one stock bottle with a metal ion or metal complex solution for the colouring of the ceramics,
- (ii) a receptacle for the colouring, and
- (iii) optionally a screen.

The invention is explained in detail in the following by means of examples, without thereby limiting it.

**Concentration-dependent colouring of zirconium oxide
stabilised by 3 mol yttrium oxide**

For the preparation of the solutions, the corresponding amounts of colour reagent are dissolved in water. Ceramic bodies are steeped in this for 5 minutes and then dried and sintered. The specimens are then ground and polished for the colorimetry. The following parameters form the basis of the colour determination:

| | |
|------------------|---|
| Opacity value O: | Measure of the transparency (0% is completely transparent, 100% is opaque), |
| L*-value: | Brightness (100: complete reflection; 0; no reflection); |

a*-value: Red-green shift (+a: red; -a: green);
b*-value: yellow-blue shift (+b: yellow; -b:
blue);

- 5 Measuring apparatus: Hunterlab LabScan Spectrocolorimeter;
Measurement method: Cielab (colour), opacity according to
ASTM D2805/TAPPI T425/TAPPI T519.

- 10 To demonstrate the independence of the colour intensity
from the action time of the solution, various action times
are used with a fixed solvent concentration and the colour
determination carried out analogously.

- 15 Commercial zirconium dioxide from Tosoh, Japan of the type
TZ3YE was used as material.

Colouring with Fe(III)Cl_3 solutions

| Concentration solution [wt.-%] | L* | a* | b* | 0 |
|-----------------------------------|-------|-------|-------|-------|
| 0 | 85.67 | -0.97 | 1.51 | 91.4 |
| 0.1 | 83.93 | -1.67 | 5.15 | 92.36 |
| 0.3 | 79.04 | -1.52 | 22.35 | 95.1 |
| 0.5 | 75.37 | 1.16 | 25 | 95.32 |
| 0.75 | 74.01 | 1.72 | 25.91 | 96.51 |
| 1 | 72.25 | 2.83 | 24.67 | 97.79 |

Colouring with Pr(III) acetate solutions

| Concentration solution [wt.-%] | L* | A* | b* | O |
|-----------------------------------|-------|-------|-------|-------|
| 0.1 | 81.02 | -3.60 | 24.98 | 89.98 |
| 0.25 | 80.80 | -3.02 | 34.17 | 91.40 |
| 0.75 | 74.85 | 4.77 | 47.31 | 92.11 |

5 **Result:** The intensity of the colour can be controlled via
the concentration of the solution.

Dependency of colour intensity on action time

10 Solution concentration: 0.75 wt.-% Fe (III) Cl solution

| Action time | L* | a* | b* | O |
|----------------|-------|-------|-------|-------|
| 2 minutes | 75.18 | 0.32 | 20.15 | 96.05 |
| 5 minutes | 76.06 | -0.42 | 21.4 | 95.86 |
| 10 minutes | 75.18 | -0.09 | 22.4 | 96.08 |
| 20 minutes | 75.80 | -0.21 | 23.11 | 96.37 |

15 **Result:** The action time has no effect on the colour
intensity.

Patent claims

1. Process for the colouring of ceramics in porous or absorbent state, characterized in that the ceramics are translucent and metal ion solutions or metal complex solutions are used for the colouring.
2. Process according to claim 1, characterized in that dental ceramics are coloured.
3. Process according to claim 1 or 2, characterized in that the solutions contain at least one of the ions or complexes of the rare earth elements or subgroups.
4. Process according to claim 3, characterized in that the solutions contain Pr, Er, Fe, Co, Ni or Cu.
5. Process according to claim 3 or 4, characterized in that chlorides, acetates or alcohols as well as oxo complexes are used as salts.
6. Process according to at least one of claims 1 to 5, characterized in that dental ceramics are used in the pre-sintered state.
7. Process according to at least one of claims 1 to 6, characterized in that dental ceramics based on zirconium oxide or aluminium oxide are used.
8. Process according to at least one of claims 1 to 7, characterized in that the ionic or complex-containing solutions are water- or alcohol-based.

9. Process according to at least one of claims 1 to 8,
characterized in that the action time of the ionic or
complex-containing solutions is a matter of hours, in
particular under two hours, quite particularly under 1
hour and particularly preferably under 20 minutes.

10. Process according to at least one of claims 1 to 9,
characterized in that the concentration of the
solutions is 0.001 to 15 wt.-%.

11. Process according to at least one of claims 1 to 10,
characterized in that colouring takes place by
immersion of the ceramic in the solutions, deposition
of the solutions to the ceramic with the help of
application instruments or by spraying of the
solutions onto the ceramic.

12. Process according to at least one of claims 1 to 11,
characterized in that the ceramics to be coloured have
a diameter of 10 mm, preferably 7 mm, and a height of
7 mm, preferably 5 mm.

13. Process according to at least one of claims 1 to 12,
characterized in that the ceramics are completely
through-coloured.

14. Kit, comprising

(i) at least one stock bottle with a metal ion or
metal complex solution for the colouring of the
ceramics,

(ii) a receptacle for the colouring, and

(iii) optionally a screen.

Colouring of ceramics by means of ionic or complex-
containing solutions

Abstract

5

The invention relates to the colouring of ceramics by means of ionic or complex-containing solutions. Solutions preferred for this contain defined concentrations of at least one of the salts or complexes of the rare earth elements or the elements of the subgroups. The invention also relates to a kit, which comprises at least one stock bottle with such a colouring solution, a receptacle for the colouring as well as optionally a screen.

10

I hereby appoint the following attorneys to prosecute this application and/or an international application based on this application and to transact all business in the Patent and Trademark Office connected therewith and in connection with the resulting patent based on instructions received from the entity who first sent the application papers to the attorneys identified below, unless the inventor(s) or assignee provides said attorneys with a written notice to the contrary:

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PLEASE NOTE:
YOU MUST
COMPLETE
THE
FOLLOWING:

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of First
Inventor, if any
Insert One This
Document is Signed
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Insert Citizenship
Insert Post Office
Address

| | | |
|---|---|--------------------------|
| GIVEN NAME/FAMILY NAME Daniel SUTTOR | INVENTOR'S SIGNATURE <i>Daniel Sutor</i> | DATE* <i>12/03/01</i> |
| Residence (City, State & Country) Seefeld GERMANY DEX | CITIZENSHIP German | |
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Full Name of Second
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Insert One This
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|---|---|--------------------------|
| GIVEN NAME/FAMILY NAME Holger HAUPTMANN | INVENTOR'S SIGNATURE <i>Holger Hauptmann</i> | DATE* <i>12/03/01</i> |
| Residence (City, State & Country) Sindelsdorf GERMANY DEX | CITIZENSHIP German | |
| MAILING ADDRESS (Complete Street Address including City, State & Country) Weilbergstrasse 32, D-82404 Sindelsdorf GERMANY | | |

Full Name of Third
Inventor, if any
Insert One This
Document is Signed
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Insert Citizenship
Insert Post Office
Address

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|---|---|--------------------------|
| GIVEN NAME/FAMILY NAME Robert SCHNAGL | INVENTOR'S SIGNATURE <i>Robert Schnagl</i> | DATE* <i>12/03/01</i> |
| Residence (City, State & Country) Landsberg GERMANY DEX | CITIZENSHIP German | |
| MAILING ADDRESS (Complete Street Address including City, State & Country) Von Eichendorff-Strasse 35, D-86899 Landsberg GERMANY | | |

Full Name of Fourth
Inventor, if any
Insert One This
Document is Signed
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Address

| | | |
|---|--|--------------------------|
| GIVEN NAME/FAMILY NAME Sybille FRANK | INVENTOR'S SIGNATURE <i>Sybille Frank</i> | DATE* <i>12/03/01</i> |
| Residence (City, State & Country) Seefeld GERMANY DEX | CITIZENSHIP German | |
| MAILING ADDRESS (Complete Street Address including City, State & Country) An der Breite 2a, D-82229 Seefeld GERMANY | | |

*DATE OF SIGNATURE